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FIGS. 5, 6. Male plants, mostly in dorsal view, $\times 15$.

FIG. 7. Cells from the apex of a stem-leaf, $\times 265$.

FIG. 1 was drawn from a specimen collected above Hoquiam, Washington, by A. S. Foster, No. 759; FIG. 2 from a specimen collected at Pacific Beach, Washington, by the same collector; and the remaining figures from specimens collected at Renton, Washington, by T. C. Frye, No. 22. The rhizoids are not represented.

NARDIA CRENULATA (Sm.) Lindb.

FIG. 8. Cells from the apex of a stem-leaf, $\times 265$.

Drawn from a specimen collected in the valley of the Barrasois, Cape Breton, Nova Scotia, by G. E. Nichols, No. 1376.

NARDIA CRENULATA GRACILLIMA (Sm.) Lindb.

FIG. 9. Cells from the apex of a stem-leaf, $\times 265$.

Drawn from a specimen collected near Herlisheim in the Vosges Mountains, by C. Müller, and distributed in Schiffner's Hep. Eur. Exsic. 361.

MISCELLANEOUS NOTES

***Eocronartium muscicola*, a fungus parasitic on moss.**—FITZPATRICK¹ has recently published a detailed account of the life history and parasitism of this fungus, giving also some natural sized photographs of *Climacium americanum* bearing the mature fungus. Probably some of our readers have noticed this fungus as it occurs on a considerable number of species of mosses: the author obtained most of his material from *Climacium americanum*, but he finds that it has been collected also on *Anomodon rostratus*, *Leskea obscura*, *L. polyantha*, *Thuidium delicatulum*, *T. minutulum*, *Amblystegium serpens*, *A. varium*, *A. riparium*, *Brachythecium oxycladon*, *Climacium dendroides*, *C. Kindbergii*, *Entodon seductrix*, *Hypnum chrysophyllum*, *Plagiothecium Muellerianum*, and *Pylaisia intricata*. It is interesting to note that the hosts, thus far reported, are all members of the two closely related families *Leskeaceae* and *Hypnaceae*.

The mycelium of the fungus persists perennially in the moss, growing up through the stems and leaves as the new shoots develop, matting together the leaves and enveloping the growing point, and eventually forming a slender club-shaped or cylindrical, usually unbranched structure often with a somewhat enlarged base, and in larger mosses, like *Climacium*, sometimes reaching a length of 6 cm., commonly about 2 cm. The author publishes the name *Eocronartium muscicola* (Fries) Fitzpatrick, synonyms being *E. typhuloides* and *E. muscigena*; the name *muscicola* having also been placed under the genera *Clavaria*, *Pistillaria*, and *Typhula* by various authors.

As to the origin of the rust fungi the suggestion is made by the author:

"Admitting that the rust fungi on ferns constitute a primitive type, it is carrying the argument only one step farther to suggest that the ancestors of these forms occurred on mosses. The Uredinales probably arose from forms similar to those now embraced in the *Auriculariaceae*, their high degree of speciali-

¹ Fitzpatrick, Harry N. The Life History and Parasitism of *Eocronartium muscicola*. Phytopathology 8: 197-218. May, 1918.

zation having resulted from their parasitic habit. The existence of a number of parasitic species of *Auriculariaceae* on mosses, and the presence in *Eocronartium muscicola* of a highly developed obligate parasitism suggest the origin of the *Uredinales* from this group."

We may thus have to watch some of the phytopathologists who are on the trail of the barberry bushes that they do not attempt to even up an old score on our mosses!

O. E. J.

Boissier Herbarium goes to the University of Geneva.—We learn from the Kew Bulletin of Miscellaneous Information (1918: 126) that the herbarium of the late E. Boissier and the accompanying library have been presented to the Botanical Institute of the University of Geneva, and that the present curator, Mr. Beauverd, will continue in office, accompanying the herbarium to its new location.

Schistostega osmundaceae, the Luminous Moss.—From a review by Dr. J. M. Coulter (Bot. Gaz. 67: 278-279. March, 1919) we learn of studies by TODA¹ on material of this interesting moss obtained from a cave in Japan. He found that the protonema can live for 7 months without producing a leafy shoot. The "chromatophores" scattered in a day in light and turned towards light in a changed direction in 7-10 days. White, blue, and violet light were the most favorable. The spores germinated in a month at about 60-77° Fahr., the leafy shoot died at about zero Fahrenheit, but the protonema could live at -5° and the optimum temperature for the leafy shoot was about 60-77° Fahr.

O. E. J.

Bryophytes and Lichens on Fell-Fields.—Dr. JOHN W. HARSHBERGER (Alpine Fell-Fields of Eastern North America. Geographical Review 7: 233-255. April, 1919) defines a fell-field as

"a rocky flat or plateau, situated in arctic or subarctic regions or on the alpine summits of mountains in northern as well as southern latitudes. The soil of a fell-field is not continuous but is broken by stones, rocks, boulders, rocky slabs, or outcropping ledges into pockets, crannies, or small areas circumscribed by the scattered or projecting rocks. Hence the surface of a fell-field is never completely covered with plants. Between the scattered patches of vegetation we see bare, pebbly, stony, sandy, or clayey soil usually devoid of humus in the ordinary acceptance of that term as meaning the organic material of the soil."

Warming has stated the characteristic feature of fell-field vegetation to be the dwarfishness of the plants and the poverty of individuals covering the bare surface. Cryptogams, such as lichens and mosses, are abundant and there are usually a goodly number of species represented. The seed plants are mainly of the cushion or tufted type, with strong perennial tap-roots, and such shrubs as appear are usually evergreen. Harshberger describes from Kruuse's

¹ Toda, Viscount Ya umochi. Physiological studies on *Schistostega osmundacea* (Dicks.) Mohr. Jour. Coll. Sci. Tokyo 40: no. 5. pp. 30. pls. 2. 1918.

account¹ the fell-fields in eastern Greenland, mentions also those of Iceland,² of South America, and of the European Alps, and then gives in considerable detail the results of his own observations on the fell-fields of some of the higher peaks of the eastern part of the United States.

On Mt. Marcy, in the Adirondacks:

"The fell-field occupies the immediate summit and roughly covers several acres of rocky ground. . . . On this circumscribed alpine fell-field of Mt. Marcy grow several interesting lichens. The soil-inhabiting ones are *Thamnolia vermicularis* with its white, frequently curled, quill-like thalli. The rounded cushions of the reindeer lichen, *Cladonia rangiferina*, are found; as is also Iceland moss, *Cetraria islandica*. The alpine club moss, *Lycopodium Selago*, is a fell-field plant; as also are such flowering plants as *Arenaria groenlandica*, *Potentilla tridentata*, *Cornus canadensis*, *Vaccinium pennsylvanicum* var. *angustifolium*, *Nabalus Boothii*, and *Ledum groenlandicum*. In the lee of rock ledges *Diapensia lapponica* was found growing in its characteristic cushion-form. *Salix uva-ursi* is a dwarf prostrate willow. The alpine rattlebox, *Rhinanthus crista-galli*, was found in flower at the summit, along with other plants which live protected in the soil pockets on rock ledges or in the crannies and crevices of the rough angular boulders or slabs of crystalline rock which lie in confusion on the dome-shaped top. Photographs of Mt. Whiteface (4,872 feet), 16 miles north of Mt. Marcy, show similar conditions of fell-field, while Giant Mountain (4,622 feet) is not bare at the summit except where shelving rocks occur."

On Mt. Katahdin³ Harshberger says, in part:

"The slopes south from the two chief peaks are covered with loose, angular fragments as far down as the (so-called) tree line. The wind-swept balsam grows in the clefts between the confused, loosely piled blocks. . . . The rocks of this fell-field formation are covered with the crustaceous lichen *Lecidea geographica*, whose thallus, alternately black and yellow, resembling a colored map, gives them a yellowish-green tone. Other crustaceous lichens begin as small patches and expand into mats and carpets which cover the boulders. *Tripe-de-roche*, *Umbilicaria* sp., as a rock lichen, accompanies the preceding form, as also several lithophytic mosses, such as *Andreaea petrophila*, *Rhacomitrium sudeticum*, and *R. aciculare*. The detritus produced by the wash, decay, and disintegration of the rocks, along with the organic remains of lichens and mosses, prepares a soil suitable for the reindeer lichen, *Cladonia rangiferina*, and Iceland moss, *Cetraria islandica*.

"Accompanying the growth of these lichens, more material is accumulated to form a soil sufficient for the plants which characterize the alpine tundra. Here are such grasses, according to Harvey, as *Hierochloa alpina*, *Agrostis rubra*, *Deschampsia flexuosa*; such sedges as *Carex vulgaris hyperborea* and rushes as *Juncus trifidus*, accompanied by mosses such as *Mielichhoferia nitida elongata*, *Polypodium commune*, *P. juniperinum*, and *P. ohioense*. In the ecologic succession of plants on this alpine fell-field, *Lycopodium annotinum* var. *pungens*, *L. Selago*, *Arenaria groenlandica*, and *Potentilla tridentata* appear or live side by side with the lichens and mosses above mentioned. This is explained by different summit

¹ Kruse, Chr. Rejser og Botaniske Undersøgelser i Ost-Grønland mellem 65° 30' og 67° 20' 1 Aarne 1898-1902, samt Angmagssalik-Egnens Vegetation. Meddelelser om Grønland 49: 1-304. 1912.

² Thoroddsen, Th. An Account of the Physical Geography of Iceland, with Special Reference to the Plant Life (the Botany of Iceland. I: 2). 1914.

³ For a detailed account of the hepatics of this mountain see LORENZ, ANNIE. Notes on the Hepaticae of Mt. Katahdin. BRYOLOGIST 20: 41-46. May, 1917. [Editor.]

areas being in a more advanced or more retrograde stage of physiographic and edaphic development. Later the low heaths appear, some growing only when sheltered by some projecting slab of granite. The pioneer heaths are *Vaccinium pennsylvanicum* var. *angustifolium*, *V. uliginosum*, *V. Vitis-Idaea*, and the cushioned *Diapensia lapponica*. Of less frequency are *Ledum latifolium*, *Arctostaphylos alpina*, *Rhododendron lapponicum*, *Cassiope hypnoides*, *Loiseleuria procumbens*, and *Phyllodoce caerulea* (*Bryanthus taxifolius*)."

The fell-fields of the Mt. Washington massif are described at length and illustrated by a number of good pictures, but the mosses and lichens are mentioned only in a rather general way, the seed plants receiving the more detailed treatment.

O. E. JENNINGS.

SULLIVANT MOSS SOCIETY NOTES

Members of the Sullivant Moss Society will be sorry to learn of the death on June 8th last, of Rev. C. H. Waddell of Grey Abbey, Ireland, who had been a member of the Society since 1907. A short note from Mrs. Waddell states that her husband had just returned from church when he was stricken without previous illness. The letter states that Mr. Waddell's botanical collections are to be divided: the mosses going to the Royal College of Science at Dublin, and the flowering plants and lichens to Queen's University, Belfast.

Since the publication of the July BRYOLOGIST, Mr. H. Sasaoka, whose address is 30, Tsukioka, Kaminiikawa, Toyama-ken, Japan, has joined the Society.

EXCHANGE DEPARTMENT

Offerings—To Society members *only*. Return postage rather than a stamped envelope, should be sent.

Mr. S. Rapp, Sanford, Florida.—*Bryum coronatum* Schwaegr., collected by Mr. Rapp at Sanford, Florida, May, 1919.

Miss Daisy Levy, 403 West 115th St., New York City.—*Ptychomitrium incurvum* (Schwaegr.) Sull., collected by Miss Levy at Harpers Ferry, West Virginia, summer of 1919.

Mr. F. E. McDonald, 417 California Ave., Peoria, Ill.—*Gymnostomum curvirostre* Hedw., c. fr., collected in Illinois, where, Mr. McDonald writes, it is a rare moss.